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“पुराने को छोड़ नये के तरफ”

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“Step Out From the Old to the New”

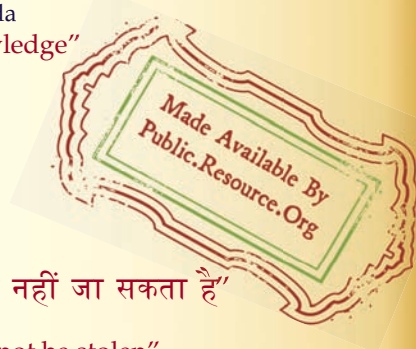
IS 10394 (1982): wooden sleepers for railway track [CED 9: Timber and Timber Stores]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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IS: 10394 -1982
(Reaffirmed 2010)

Indian Standard
SPECIFICATION FOR
WOODEN SLEEPERS FOR RAILWAY TRACK

(First Reprint JANUARY 1998)

UDC 625.142.2

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

SPECIFICATION FOR WOODEN SLEEPERS FOR RAILWAY TRACK

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(Continued on page 2)

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IS : 10394 - 1982

(Continued from page 1)

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(Continued on page 27)

**AMENDMENT NO.1 MARCH 1992
TO
IS 10394 : 1982 SPECIFICATION FOR WOODEN
SLEEPERS FOR RAILWAY TRACK**

(Pages 19 to 21, Appendix A) — Insert '†' mark against the following timber species :

Albizia lebbek
Albizia odoratissima
Albizia procera
Anogeissus latifolia
Artocarpus hirsutus
Artocarpus lakoocha
Bridelia spp.
Cedrus deodara
Hardwickia binata
Hopea spp. (other than *Hopea odorata*)
Lagerstroemia hypoleuca
Lagerstroemia lanceolata
Mesua ferrea
Pocillonuron indicum
Terminalia paniculata
Vitex spp.

(Pages 19 to 21, Appendix A) — Insert the following foot-note at pages 19 and 20:

‘†These species are those which are naturally durable hard woods requiring no preservative treatment, provided only heartwood is used.’

(CED 09)

Printed at Simco Printing Press, Delhi, India

Indian Standard

SPECIFICATION FOR WOODEN SLEEPERS FOR RAILWAY TRACK

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 24 December 1982, after the draft finalized by the Timber Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 One of the important uses of wood is as wooden sleepers on the railway tracks. Although, sleepers of alternate materials, namely, concrete metal, etc, have also been substituted in place of wooden sleepers, yet under certain situations there is no substitute for wooden sleepers which will continue to be used on railway tracks. This standard has, therefore, been prepared to cover the requirements of wooden sleepers and wooden specials used on railway tracks. The preparation of the standard on the subject has been taken up with due concurrence of Railway Board.

0.3 In the formulation of this standard due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS: 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the requirements of wooden sleepers and wooden specials used for broad gauge, metre gauge and narrow gauge railway tracks.

2. TERMINOLOGY

2.0 For the purpose of this standard, the definitions given in IS : 707-1976† and the following shall apply. For other terms, Fig. 1 shall be referred.

*Rules for rounding off numerical values (*revised*).

†Glossary of terms applicable to timber technology and utilization (*second revision*).

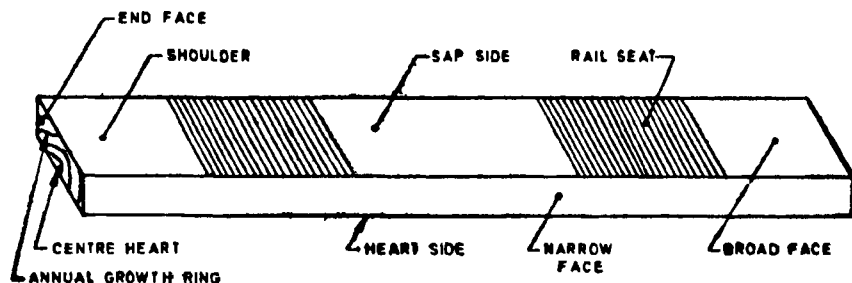


FIG. 1 RAILWAY SLEEPER NOMENCLATURE

2.1 Composite Sleeper Index (CSI) — It is an arithmetical figure to serve as a guide for evaluating relative importance of different timber species from strength point of view for use as railway sleepers. It is obtained by combining the values of a few basic strength and hardness properties considered important for use as railway sleepers.

2.2 Defect — An abnormality or irregularity in wood which lowers the life of a sleeper by decreasing its normal strength.

2.3 Distortion — It is identified by any deviation in a sleeper from a true plane surface causing departure from its original plane. It includes bow, cup, spring, twist, etc (*see Fig. 7*).

2.4 Quartered Sleepers — When sawn from a tree of such a size that at least four sleepers can be cut from a section, each one of them is known as quartered sleeper. The heart line in such sleepers, some times, appears at the corner. This defect is more noticeable in sleepers sawn from trees of small sections. Owing to its position a split is likely to develop in the heart line when the sleeper is in the track (*see Fig. 8*).

2.5 Rail Seat — The portion of the full width of the sleeper under a rail or under a bearing plate which bears the load directly. Its position is fixed from centre of the sleeper (*see Fig. 2*).

2.5.1 The area and the position of the rail seat region from the centre of the sleeper shall be as given in Table 1.

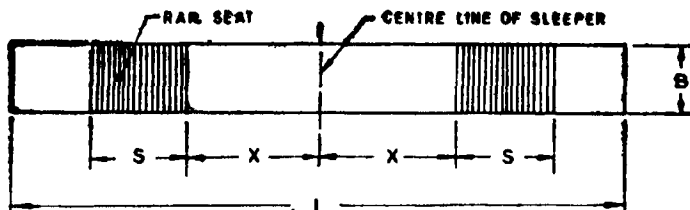
NOTE — The position of rail seat region in standard size sleepers is given in Fig. 2.

2.6 Perpendicular Grain Sleeper — A sleeper in which the annual growth rings as seen at its end face appear nearly at right angles to the width of the sleeper (*see Fig. 3*).

2.7 Ruptured End — The broken end of a sleeper (*see Fig. 4*).

TABLE 1 AREA AND POSITION OF RAIL SEAT*(Clause 2.5.1 and Fig. 2)*

DISTANCE OF GAUGE POINTS BETWEEN TWO PARALLEL RAILS, <i>Min</i>	WIDTH OF SLEEPER, <i>B</i>	LENGTH OF RAIL SEAT, <i>S</i>	AREA	POSITION OF RAIL SEAT REGION FROM CENTRE OF SLEEPER
(cm)	(cm)	(cm)	(cm ²)	(cm)
BG (167·64)	25	33·0	825	71·5 - 104·5
MG (100·00)	20	28·5	570	38·5 - 67·0
NG (76·20 & 61·00)	18	28·5	513	19·0 - 55·5



GAUGE	<i>L</i> (cm)	<i>B</i> (cm)	<i>X</i> (cm)	<i>S</i> (cm)
BG (167·6)	275	25	71·5	33
MG (100·0)	180	20	38·5	28·5
NG (76·2)	150	18	27·0	28·5
NG (61·0)	150	18	19·0	28·5

**FIG. 2 POSITION OF RAIL SEAT REGION IN
STANDARD SIZE SLEEPERS**

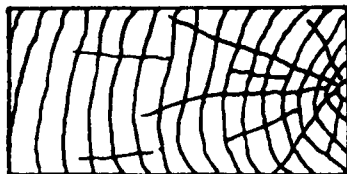


FIG. 3 PERPENDICULAR GRAIN SLEEPER

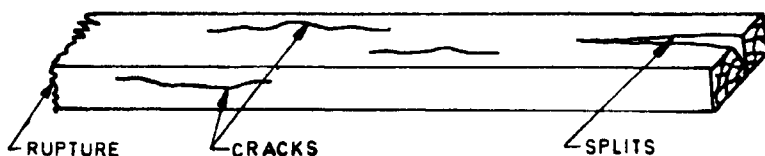


FIG. 4 RUPTURED-END SPLIT AND CRACKS

3. TIMBER SPECIES

3.1 Any of the timber species mentioned in Appendix A may be used for manufacturing railway sleepers.

3.1.1 *Composite Sleeper Index* — Index (CSI) of all the species are given against each (see Appendix A) for general guidance. Recommended minimum composite sleeper index for different track positions are given in Appendix B. CSI of all the species have been derived based on CGS units. The procedure for calculating the composite sleeper index for various species is given at Appendix C.

4. DIMENSIONS AND TOLERANCES

4.1 *Track Sleepers* — The dimensions for the standard track sleepers shall as given in Table 2.

TABLE 2 DIMENSIONS FOR STANDARD TRACK SLEEPERS

(Clause 4.1)

GAUGE	LENGTH (cm)	TOLERANCE IN LENGTH, %	CROSS-SECTIONAL DIMENSIONS (cm)	TOLERANCE IN CROSS- SECTION, %
Broad gauge (BG)	275	+ 10 } - 2.5 }	25 × 13	+ 10 } - 5 }
Metre gauge (MG)	180	do	20 × 11.5	do
Narrow gauge (NG)	150	do	18 × 11.5	do

4.2 Special Sleepers — The dimensions for special sleepers which include sleepers used on bridges and crossings shall be as given in Table 3.

NOTE — For special sleepers, any size other than those given in Table 3 may be supplied as agreed to between the purchaser and the supplier.

TABLE 3 DIMENSIONS FOR SPECIAL SLEEPERS

(Clause 4.2)

GAUGE	CROSS-SECTION (cm)	TOLERANCE IN CROSS-SECTION, %	LENGTH (cm)	TOLERANCE IN LENGTH, %
BG	25 × 15	+ 5 } - 2.5 }	275, 305, 335 and onwards varying by 30 cm	+ 5 } - 1.25 }
	28 × 15	do	do	do
	25 × 18	do	do	do
MG	20 × 13	do	185, 215, 245 and onwards varying by 30 cm	do
	25 × 13	do	do	do
	20 × 15	do	do	do
NG	18 × 13	do	do	do
	20 × 13	do	do	do
	25 × 13	do	do	do

5. GENERAL REQUIREMENTS

5.1 Preservative Treatment — The sleepers of all the species containing sapwood and those not indicating with an asterisk mark in Appendix A shall be given preservative treatment as given in IS:.....*.

6. GRADING

6.1 Railway sleepers shall be of two classes, namely, Class I and Class II, depending on permissible defects. A sleeper shall be classified as of the Class II even if it is of that class in terms of only one defect and is of the Class I in terms of all other defects. Likewise, a sleeper shall be rejected if the permissible range in any one of the defects is exceeded.

6.2 Special sleepers shall of Class I only.

*Code of practice for preservation and treatment of railway wooden sleepers (under preparation).

7. PERMISSIBLE DEFECTS

7.1 Permissible defects for different grades of railway sleepers shall be within the limits given in Table 4.

NOTE — For ready reference and guidance some of the common defects occurring in railway sleepers are illustrated in Fig. 5 to 12.

TABLE 4 PERMISSIBLE DEFECTS FOR DIFFERENT GRADES OF RAILWAY SLEEPERS

Sl. No.	DEFECT	CLASS I AND SPECIAL RAILWAY SLEEPERS	CLASS II RAILWAY SLEEPERS
(1)	(2)	(3)	(4)
1.	Centre-heart (small, sound and tight for all cases) (see Fig. 5 & 6)	i) When the depth of sleeper lies between 10 to 13 cm, the centre heart shall be only on one end face (see Fig. 5) and shall be within 5.0 cm for BG, 4.0 cm for MG and NG sleepers from the nearest broad face. ii) When the depth of the sleeper is 13 to 15 cm, clamped centre-heart (see Fig. 6) on one or both end faces within 5 cm of the nearest broad face shall be permitted. iii) When the depth of the sleeper is over 15 cm, clamped centre-heart anywhere on one or both end faces shall be permitted.	Clamped centre heart on one or both end faces appearing anywhere shall be allowed for track sleepers.
2.	Decay	If the decay can be chiselled down to sound wood within 1 cm at the region of the rail seat and within 2 cm elsewhere, it shall not be treated as defect, but the sleeper shall be rejected if it exceeds these limits.	Same as Class I sleepers.
3.	Borer Holes (Insect attack)	i) Any number of borer hole made by shot-hole borer shall not be considered a defect, if these do not appear on or under the rail seat area.	Same as Class I sleepers.

(Continued)

TABLE 4 PERMISSIBLE DEFECTS FOR DIFFERENT GRADES OF RAILWAY SLEEPERS — Contd

Sl. No.	DEFECT	CLASS I AND SPECIAL RAILWAY SLEEPERS	CLASS II RAILWAY SLEEPERS
(1)	(2)	(3)	(4)
		ii) Borer hole up to 1.3 cm dia shall be permissible, provided their number does not exceed one for every 1 000 cm ² of peripheral area and are properly plugged with the same species of timber.	Borer hole up to 2.5 cm dia provided their number does not exceed one under the rail seat region and up to 5.0 cm dia elsewhere shall be permissible provided these do not occur in clusters and are properly plugged with the same species of timber.
4.	<i>Knots</i> (Dia measured along the minor axis)	i) Sum of diameters of all the live or sound knots up to 7.5 cm, provided no single knot is more than 2.5 cm in dia, near the rail seat region, and up to 7.5 cm dia elsewhere, shall be permissible but they shall not occur in clusters so as to reduce the strength of the sleeper and no knot shall fall within the spike line. In case of special sleepers any number of knots of anywhere on the sleeper none exceeding 5 cm in dia are permissible provided they do not fall on the spike line.	Sum of diameters of knots in the rail seat region shall not exceed 7.5 cm and no single knot shall exceed 2.5 cm in dia. Elsewhere any number of knots up to 10 cm dia provided they do not fall on the spike line and do not occur in clusters to reduce the normal strength of the sleeper.
		ii) <i>Loose or Hollow Knots</i> shall not be permissible.	No loose or hollow knot shall be permissible under the rail seat, but any number of knots elsewhere, none exceeding 10 cm in dia, shall be permissible provided these are properly plugged with the same species of timber.
		iii) <i>Decay or Unsound Knots</i> shall not be permissible.	Decayed and unsound knots shall not be permissible under the rail seat, but any number of knots elsewhere, none exceeding 10 cm in dia, shall be permissible provided these are properly plugged with the same species of timber after scoop out the decay.

(Continued)

TABLE 4 PERMISSIBLE DEFECTS FOR DIFFERENT GRADES OF RAILWAY SLEEPERS — Contd

Sl. No.	DEFECT	CLASS I AND SPECIAL RAILWAY SLEEPERS	CLASS II RAILWAY SLEEPERS
(1)	(2)	(3)	(4)
5.	<i>Perpendicular Grain Sleeper</i>	Perpendicular grain sleeper with perpendicular grain even on one face and not containing centre-heart shall not be permitted.	Same as for Class I sleepers.
6.	<i>Warp</i> (Distortion) (see Fig. 7)	Deviation on measured dimensions due to warp shall not exceed the limits mentioned in (a) to (d). a) <i>Spring</i> — With a string stretched from end to end along the middle of the narrow face, the maximum depth anywhere from horizontal shall not exceed 0.65 cm per 30 cm length of sleeper. b) <i>Cup</i> — With a straight edge laid anywhere along the width of the sleeper, the maximum depth from the horizontal shall not exceed 1.3 cm. c) <i>Bow</i> — With a string stretched from end to end along the middle of the broad face, the maximum depth from the horizontal shall not exceed 0.65 cm per 30 cm length for track sleepers and 0.30 cm per 30 cm length subject to a maximum of 3.0 cm for specials. d) <i>Twist</i> — Permissible if adzing up to 0.65 cm removes the distortion.	Same as for Class I sleepers. Same as for Class I sleepers. Same as for Class I sleepers.
7.	<i>Quartered Sleepers</i> (see Fig. 8)	Heart line visible either on the narrow face or on the broad face of sleeper 25.5×17.5 cm and more in cross-section shall not be considered a defect. Heart line shall not be permissible in sleepers of smaller cross-section.	Same as for Class I sleepers.

(Continued)

TABLE 4 PERMISSIBLE DEFECTS FOR DIFFERENT GRADES OF RAILWAY SLEEPERS — *Contd*

Sl. No.	DEFECT	CLASS I AND SPECIAL RAILWAY SLEEPERS	CLASS II RAILWAY SLEEPERS
(1)	(2)	(3)	(4)
8.	<i>Ruptured End</i>	Ruptured end not permissible.	Same as for Class I sleepers.
9.	<i>Sap-Wood</i>	i) It shall not exceed 25% of any surface dimension under the rail seat and 33% elsewhere for track and bridge sleepers. ii) Sleepers meant for use on crossings shall not contain more than 50% sapwood for a distance up to 30 cm from either end and 33% elsewhere. iii) Where wane occurs in a sleeper sum total of the actual measure of the wane and sapwood shall not exceed the prescribed limits for sapwood.	It shall not exceed 33% of any surface dimension under the rail seat and 50% elsewhere. Unlimited sapwood shall be permitted for track sleepers provided they are properly treated.
10	<i>Cracks</i> (on the broad and narrow faces) (see Fig. 9)	i) Cracks along the grain shall not occur on the spike line, elsewhere these shall be permitted provided the sum of all the cracks does not exceed 75 cm in length and 0.71 cm in width. ii) Cracks across the grain shall be of any length but shall not exceed 0.2 cm in width.	Same as for Class I sleepers. Same as for Class I sleepers.
11.	<i>Splits</i> (on broad and narrow faces and clamped in the end face) (see Fig. 9)	i) Heart split anywhere on heart side broad face shall not exceed 1.3 cm in depth. ii) Heart split line with the points and maximum depth lying beyond 4.0 cm from either edge; and in case heart split line touching one edge, but beyond 7.5 cm from the other edge, maximum depth shall not exceed 6.5 in for BG and 5 cm for MG and NG.	Same as for Class I sleepers. Heart split line with its points of maximum depth lying beyond 4.0 cm from either edge; and in case heart split line touching one edge, but beyond 7.5 cm from the other edge maximum depth shall not exceed 7.5 cm for BG 6.5 cm for MG and NG.

(Continued)

TABLE 4 PERMISSIBLE DEFECTS FOR DIFFERENT GRADES OF RAILWAY SLEEPERS — Contd

Sl No.	Defect	CLASS I AND SPECIAL RAILWAY SLEEPERS	CLASS II RAILWAY SLEEPERS
(1)	(2)	(3)	(4)
		iii) No other splits shall exceed 2.5 cm in length per 30 cm length of the sleeper and gap shall not be more than 0.90 cm.	No other splits shall exceed 4.0 cm in length per 30 cm length of the sleeper and gap shall not be more than 0.65 cm.
12.	<i>Shakes</i> (on end faces) (see Fig. 10)	i) Any number of cup shakes permissible provided the cup shake does not exceed 7.5 cm in length of the arc and not extending to 5 cm of any edge and shall not be more than one in the same growth ring. ii) Cup shakes not more than 1.5 cm in depth and do not fall within 30 cm from the end of the sleeper which are not visible in the end face but appear as parallel cracks on the heart side broad face shall be permissible. iii) Any number of clamped heart, radial and star shakes shall be permissible. iv) All types of permissible cracks, shakes, splits, etc, shall be such that they do not fall and are not likely to extend in the near future towards spike line. All heart, radial and star shakes shall be clamped.	Same as for Class I sleepers. Same as for Class I sleepers. Same as for Class I sleepers.
13.	<i>Slope of Grain</i>	The slope grain when measured by standard templates shall not exceed 1 in 15 on the broad face and 1 in 30 on the narrow face.	Same as for Class I sleepers.

(Continued)

TABLE 4 PERMISSIBLE DEFECTS FOR DIFFERENT GRADES OF RAILWAY SLEEPERS — Contd

Sr. No.	DEFECT	CLASS I AND SPECIAL RAILWAY SLEEPERS	CLASS II RAILWAY SLEEPERS
(1)	(2)	(3)	(4)
14.	<i>Wane</i> (Measured along surface in direction at right angles to the length of the sleepers) (see Fig. 11)	i) The wane shall not exceed 12% of the surface dimensions under the rail seat and 15% elsewhere for track and bridge sleepers. ii) The wane shall not exceed 25% for a distance of 30 cm from either end and up to 15% elsewhere for crossing and special sleepers.	The wane shall not exceed 15% of the surface dimension under the rail seat and 25% elsewhere for track and bridge sleepers. Same as for Class I sleepers.
15.	<i>Winding Heart</i> (see Fig. 12)	i) Sleepers with winding heart in which the heart line is not visible throughout its course or in which it appears in both the broad faces or at the rail seat region shall be rejected. ii) Heart line appearing only on the narrow face, but not more than 2.5 cm away from the heart side shall be permitted.	Same as for Class I sleepers. Heart line appearing only on the narrow face but not more than 4.0 cm away from the heart side shall be permitted.

8. INSPECTION

8.1 The inspection of track sleepers and specials of all gauges shall be carried out as given in Appendix D or as agreed to between the parties concerned.

9. MARKING

9.1 Each sleeper shall be engraved with the identification 'Code letters' indicating timber species and the year of laying. For example SAL sleeper laid in 1980 shall be engraved as 'S 80'. Code letters for various species are given at Appendix A.

IS : 10394 - 1982

9.1.1 The sleeper may also be marked with Standard mark.

9.1.2 The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

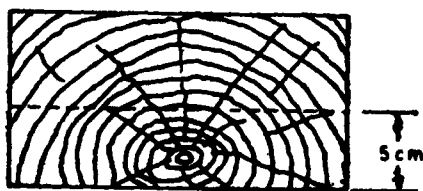


FIG. 5 CENTRE-HEART NEAR ONE END FACE

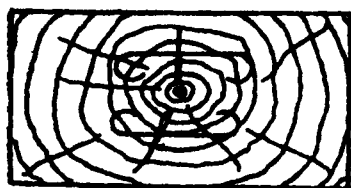
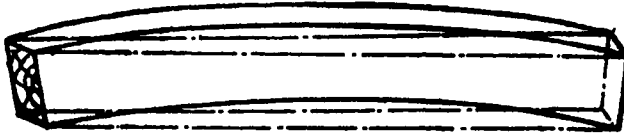


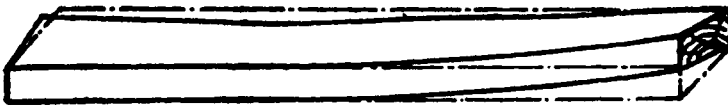
FIG. 6 CLAMPED CENTRE-HEART SLEEPER



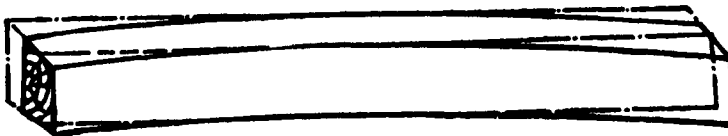
7A CROOK OR SPRING



7B CUP

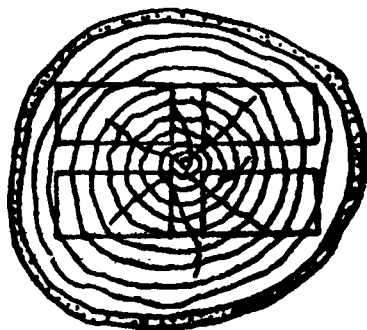


7C TWIST

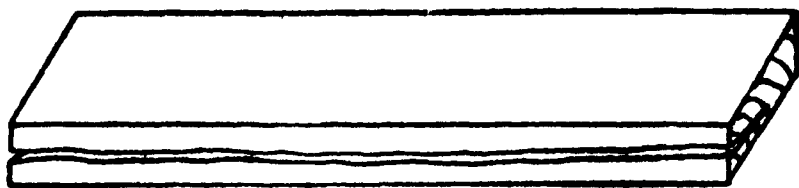


7D BOW

FIG. 7 WARP (DISTORTION)

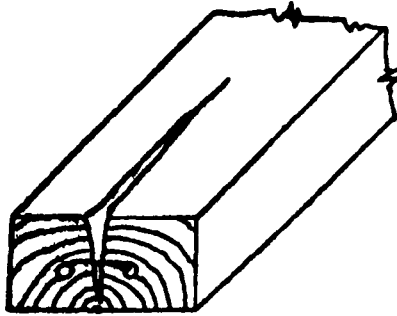


8A QUARTERED SLEEPER
END VIEW

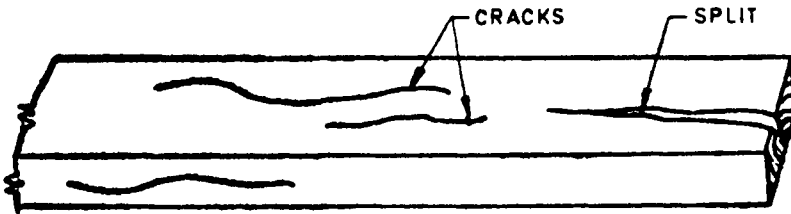


8B QUARTERED SLEEPER END CRACK
EXTENDED ON THE SMALL FACE

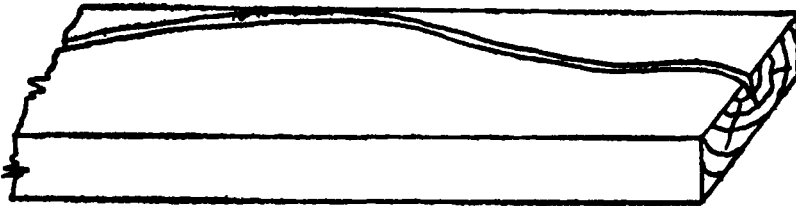
FIG. 8 QUARTERED SLEEPER



9A CLAMPED END SPLITS



9B RUPTURED END SPLIT AND CRACK



9C HEART SPLIT

FIG. 9 SPLITS AND CRACKS

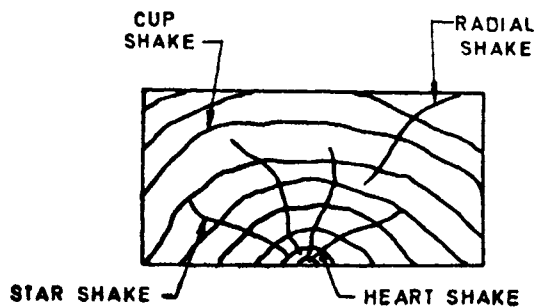
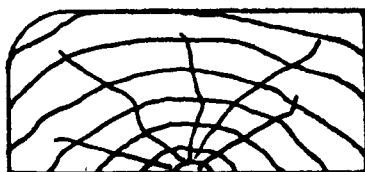


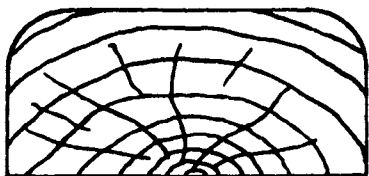
FIG. 10 SHAKES



11A SINGLE ROUND



11B SINGLE WANE

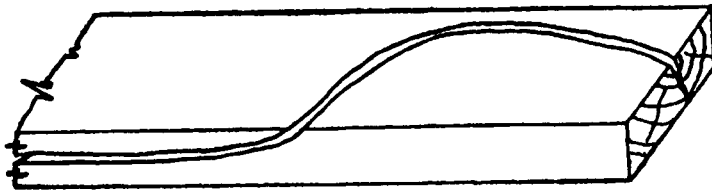


11C DOUBLE WANE

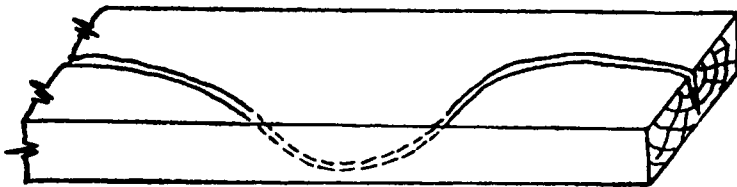


11D DOUBLE ROUND

FIG. 11 WANE



12 A WINDING HEART
(BROAD FACE TO NARROW FACE)



12 B WINDING HEART
(BROAD FACE TO BROAD FACE)

FIG. 12 WINDING HEART

APPENDIX A

(Clauses 3.1 and 9.1)

TIMBER SPECIES SUITABLE FOR RAILWAY SLEEPERS

Botanical Name	Standard Trade Name	Composite Sleeper Index (CSI)	Code Letters*
<i>Acrocarpus fraxinifolius</i>	mundani	87	MD
<i>Albizia lebbek</i>	kokko	78	KK
† <i>Albizia odoratissima</i>	kala-siris	111	KS
<i>Albizia procera</i>	safed-siris	80	KR
<i>Altingia excelsa</i>	jutili	104	JT

*These are different from those given in IS: 1150-1976 Trade names and abbreviated symbols for timber species (second revision).

†These species are slightly difficult to treat and as such require incision before treatment.

IS : 10394 - 1982

<i>Botanical Name</i>	<i>Standard Trade Name</i>	<i>Composite Sleeper Index (CSI)</i>	<i>Code Letters*</i>
<i>Amoora</i> spp.	amarī (lali)	66	LL
<i>Anogeissus latifolia</i>	axlewood (bakli)	103	AW
<i>Artocarpus chaplasha</i>	chaplash	65	CP
<i>Artocarpus hirsutus</i>	aini	79	AN
<i>Artocarpus lakoocha</i>	lakooch	62	LK
<i>Bridelia</i> spp.	kassi	65	KI
<i>Calophyllum</i> spp.	poon	75	PN
<i>Castanopsis</i> spp.	Indian chestnut (Hingori)	70	HG
<i>Cedrus deodara</i>	deodar	63	D
<i>Chukrasia velutina</i> (Syn. <i>C. tabularis</i>)	chuckrassy	74	CS
<i>Cullema rosayraana</i> (Syn. <i>C. excelsa</i>)	karanī	74	PL
<i>Dillenia</i> spp.	dillenia	69	DT
<i>Dipterocarpus macrocarpus</i>	hollong	80	HL
<i>Dipterocarpus</i> spp. (other than <i>D. macrocarpus</i>)	gurjan	73	G
<i>Grewia tiliafolia</i>	dhaman	108	DM
<i>Hardwickia binata</i>	anjan	103	A
<i>Hopsea</i> spp. (other than <i>Hopsea oderata</i>)	hopra	142	HP
<i>Kingiodendron pinnatum</i> spp. (Syn. <i>Hardwickia pinnata</i>)	piney (kolavu)	68	KV
<i>Lagerstroemia hypoleuca</i>	pyinma	63	PJ
† <i>Lagerstroemia lanceolata</i>	benteak	79	BT
<i>Lagerstroemia parviflora</i>	lendi	80	LD
<i>Lagerstroemia speciosa</i> (Syn. <i>L. floribunda</i>)	jarul	73	JR
<i>Mangifera</i> spp.	mango	67	—
<i>Manilkara</i> spp.	bulletwood	131	PW
<i>Maniltoa polyantha</i> (Syn. <i>Cynometra polyantha</i>)	pinne	116	PG
<i>Mesua ferrea</i>	mesua	157	NL

*These are different from those given in IS : 1150-1976 Trade names and abbreviated symbols for timber species (second revision).

†These species are those which are naturally durable hard woods requiring no preservative treatment, provided only heartwood is used

<i>Botanical Name</i>	<i>Standard Trade Name</i>	<i>Composite Slipper Index (CSI)</i>	<i>Code Letters*</i>
† <i>Palaquium ellipticum</i>	pali	74	PI
<i>Peciloneuron indicum</i>	ballagi	162	SY
<i>Pinus roxburghii</i>	chir	48	C
<i>Planchonia valida</i> (Syn P. andamanica)	red bombwe	100	BL
‡ <i>Pterocarpus marsupium</i>	bijasal	84	VG
<i>Schima wallichii</i>	chilauni	65	SW
<i>Schleichera oleosa</i> (Syn. S. trijuga)	kusum	114	PU
<i>Shorea assamica</i>	makai	57	MK
‡ <i>Shorea robusta</i>	sal	110	S
<i>Stereospermum</i> spp.	padri	82	PA
† <i>Syzgium</i> spp.	jaman	93	JN
<i>Terminalia arjuna</i>	arjun	84	AR
<i>Terminalia bellirica</i>	bahera	77	TN
<i>Terminalia bialata</i> (sapwood)	white chuglam	79	WC
<i>Terminalia chebula</i>	myrobalan	117	KD
<i>Terminalia manii</i>	black chuglam	101	BG
<i>Terminalia myriocarpa</i>	hollock	63	HK
<i>Terminalia paniculata</i>	kindal	88	PM
<i>Terminalia procera</i>	white bombwe	68	BM
<i>Terminalia alata</i> (Syn T. coriacea & T. crenulata)	laurel	103	—
<i>Vitex</i> spp.	milla	125	ML
‡ <i>Xylia xylocarpa</i>	irul	120	I

NOTE 1 — For classification of timber species, reference may be made of IS : 399-1963 Classification of commercial timbers and their zonal distribution (revised).

NOTE 2 — Fir and Kail, which have CSI less than the prescribed limits (see Appendix B) may be accepted in special cases by the purchaser.

*These are different from those given in IS : 1150-1976 Trade names and abbreviated symbols for timber species (second revision).

†These species are slightly difficult to treat and as such require incision before treatment.

‡These species are those which are naturally durable hard woods requiring no preservative treatment, provided only heartwood is used.

APPENDIX B

(Clause 3.1.1)

RECOMMENDED MINIMUM COMPOSITE SLEEPER INDEX FOR DIFFERENT TRACK POSITIONS

Sl No.	Track Position	Composite SLEEPER Index (CSI)
1.	Ordinary track sleepers	48
2.	Special sleepers for bridges	103
3.	Special sleepers for crossings	88

APPENDIX C

(Clause 3.1.1)

PROCEDURE FOR CALCULATING THE COMPOSITE SLEEPER INDEX

C-1. PROCEDURE

C-1.1 The CSI is obtained from a suitable combination of the following properties with certain adjustments and weightages :

- The general strength figure both for green as well as dry timber at 12% moisture content.....S, and
- The general hardness figure both for green as well as dry timber at 12% moisture content.....H by the formula :

$$CSI = \frac{S + 10H}{20}$$

C-1.2 'S' is based on the green and dry values of :

- Modulus of rupture (static bending),
- Fibre stress at elastic limit (static bending),
- Fibre stress at elastic limit (impact bending),
- Maximum crushing stress (compression parallel to grain), and
- Fibre stress at elastic limit (compression parallel to grain).

C-1.3 'H' is based on the green and dry value of :

- Fibre stress at elastic limit (compression perpendicular to grain),
- End hardness,

- c) Radial hardness, and
- d) Tangential hardness.

C-1.4 Based on the above formula, the CSI has been worked out for a number of Indian species for use as sleepers (*see* Appendix A).

APPENDIX D

(*Clause 8.1*)

INSPECTION OF RAILWAY SLEEPERS

D-1. INSPECTION

D-1.1 Inspection of sleepers shall be carried out as under.

D-1.1.1 Inspection of sleepers in green condition shall not be done. Inspection shall be carried out at least two months after conversion; and it may be insured that the sleepers are not exposed to rains during the intervening period.

D-1.1.2 Water borne sleepers shall be allowed to dry in the yard for at least one month before inspection. This period may be reduced to between 15 to 30 days during hot season.

D-1.1.3 All sleepers shall be cleaned of mud, dirt and plaster, if any, from the end faces before inspection.

D-1.1.4 Sleepers shall be spread with the heart side up and on supports parallel to one another.

D-1.1.5 All sleepers shall bear the contractor's identification mark.

D-1.1.6 Clamps, when necessary, shall be in accordance with Appendix E and shall be properly fixed.

D-1.1.7 Lengths longer than those permissible shall be cut off.

D-1.1.8 In the case of specials, dimensions of each sleeper shall be marked in the middle of the broad face in white figures in the order of length, width and thickness.

Note — For convenience, sleepers of the same size shall be placed in one lot.

D-1.1.9 The inspecting officer shall examine all faces of each sleeper. He may employ any means he considers necessary to satisfy himself that sleepers conform to the specifications laid down in the standard.

Passed and rejected sleepers shall be marked separately.

D-1.1.10 Previously rejected sleepers shall not be offered for re-inspection.

D-1.1.11 The contractor shall put a small identification mark near the inspecting officers mark of acceptance.

D-1.1.12 On the conclusion of an inspection, the contractor shall give to the inspecting officer a certified list showing details of all sleepers passed and rejected.

D-1.1.13 Transport and storage of passed sleepers shall be carried out as per the instructions of the inspecting officer in accordance with the supply agreement.

D-1.1.14 In the event of dispute on the standard of inspection, the opinion of the authority specified in the supply agreement shall be final.

A P P E N D I X E

(Clause D-1.1.6)

REQUIREMENTS FOR STEEL CLAMPS FOR WOODEN SLEEPERS

E-1. SCOPE

E-1.1 This Appendix covers the requirements, methods of sampling and tests for steel clamps used with wooden sleepers in railway track.

E-2. MATERIAL

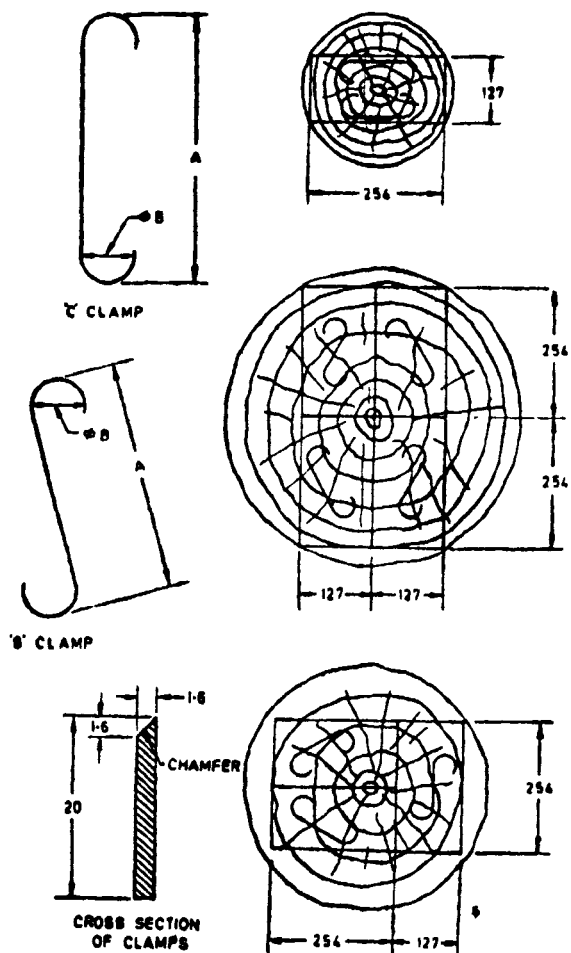
E-2.1 The clamps shall be manufactured from steel conforming to grade St. 42-1079 of IS : 1079-1973*.

E-2.1.1 When steel proposed is not as per grade St. 42-1079 of IS : 1079-1973*, its detailed specification shall be mentioned with the prior approval of the purchaser.

E-3. MANUFACTURE

E-3.1 The sheets from which the clamps are manufactured, shall be sheered instrips to the required width and one side chamfered to form an edge to facilitate it being driven into wood. It shall then be bent accurately to the dimensions and tolerances shown in Fig. 13 and shall be free from imperfection and heavy scales.

*Specification for hot rolled carbon steel sheet and strip (*third revision*).



GAUGE	A mm	B mm
BG	130	40
MG	100	20
NG	100	20

All dimensions in millimetres.

FIG. 13 'C' AND 'S' CLAMPS FOR WOODEN SLEEPERS

E-4. TESTS

E-4.1 A minimum of six clamps or 0.1 percent of the lot/batch offered for inspection, shall be selected at random for dimensional check.

E-4.1.1 The test clamps after having been checked with gauges for correctness of shape and contour shall be subjected to tests under E-4.2 and E-4.3.

E-4.2 Fitting Test — The test shall be carried out on at least 6 clamps. The chamfered side of the clamps shall be driven into the cross-section of the sleeper that the other side of the clamp becomes flush with the sleeper. The bearing surfaces shall be in the appropriate planes and there shall be no appreciable twist or side way distortion in the finished clamps.

E-4.3 Application Test — The test clamps, which have passed the fitting test (E-4.2) shall further be capable of being driven in sleepers at least three times, one after the other without any significant distortion in its original shape.

E-5. RE-TESTS

E-5.1 Should any one of the test clamp first selected fail to pass any one of the tests specified in E-4, two further samples shall be selected from the same lot for testing in respect of each failure. Should the test clamps from both these additional samples pass, the clamps represented by the test samples shall be deemed to comply with the requirement of that particular test. Should the test clamps from either of these additional samples fail, the lot represented by the test clamps shall be deemed as not conforming to this specification and shall be rejected.

E-6. PROTECTION

E-6.1 All clamps shall be dipped in hot boiled linseed oil conforming to IS : 77-1976* after they have been inspected and approved and shall not be packed until the oil has dried to an elastic film free from tackiness.

*Specification for linseed oil, boiled for paints (second revision).

(Continued from page 2)

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